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A revision of some species of *Ectropothecium*

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(WITH PLATES 13 AND 14)

Whilst studying lately some West Indian examples of the genus *Ectropothecium* Mitt., received from the New York Botanical Garden, U. S. A., it became necessary to examine the type-specimens of the following plants — *E. vesiculare* (Schwaegr.) Mitt., *E. rutilans* (Brid.) Mitt., *E. malachiticum* (C. Müll.) Paris, *E. Poeppigianum* (Hampe) Jaeger, *E. conostegum* (C. Müll.) Mitt., *E. flavoviride* Mitt., *E. crassicaule* Mitt., *Hookeria praelonga* W. Arnott and the plant sent out under the name *Hypnum Montagnei* Schimp. in Wright's Cuban Mosses, number 120. The result of the study and comparison of type specimens and authentic examples of the above plants has enabled me to make the following revision.

Bridels' *Leskia rutilans* (1827) from St. Domingo proves to be identical with Schwaegrichen's *Hypnum vesiculare* (1827) from Jamaica; and Müller's *Vesicularia malachitica* (1898) from Porto Rico is also the same species. A specimen in Mitten's herbarium labeled "Brazil" is also to be referred to *E. vesiculare*.

Hampe's *Hookeria Poeppigiana* (1844), from Peru, which has been sunk in *E. vesiculare*, proves to be a well marked variety of that species, and to be identical with Müller's *Hypnum conostegum* (1851) from Cuba and St. Domingo. Mitten's *E. flavoviride* (1869) from Cuba is a form of this same variety *Poeppigianum*.

*E. crassicaule* Mitt. (1869) from Cuba appears distinct from all the above mentioned plants.

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*Hookeria praelonga* W. Arnott, from Rio de Janeiro, which has been referred to *E. vesiculare*, proves to be a species of *Ectropothecium* allied to, if not identical with, *E. amphibolum* Spruce.

As regards "*Hypnum Montagnei* Schimp." the following plants have been sent out under the number 120 in Wright's Cuban Mosses. In Mitten's herbarium and in the Kew herbarium three distinct plants appear under the number 120, viz., *E. vesiculare* (Schwaegr.), *E. vesiculare Poeppigianum* (Hampe), and *E. crassicaule* Mitt. In Müller's herbarium both *E. vesiculare* and the variety *Poeppigianum* are found under the number 120. The plant quoted by Mitten, "Wright, inter 120," as belonging to *E. amphibolum* Spruce proves to be *E. vesiculare*. The plant, "n. 120 ex parte" in Mitten's herbarium, on which Mitten founded his *E. flavoviride* is a form of the variety *Poeppigianum*; while *E. crassicaule* Mitt. founded also on "n. 120 ex parte" proves, as mentioned above, to be a distinct species. It may be mentioned here that from Montagne's original description of "*H. Montagnei*" the plant appears to be *E. vesiculare Poeppigianum*; specimens from Montagne's herbarium, however, are *E. vesiculare* type.

The result of the above investigations shows how necessary it is in the first place, in describing the moss-flora of any country, to examine types and historical specimens in herbaria in order to remove the errors which have accumulated round certain species.

My sincere thanks are due to the authorities at the Berlin Museum and the Herbar Boissier for kindly allowing me to see specimens from, respectively, Müller's and Schwaegrichen's herbaria; to Mr. William Mitten, A.L.S., for kindly sending me a large number of specimens of *Ectropothecium* from his herbarium; and to Professor F. O. Bower, F.R.S., for allowing me to examine a specimen from Walker-Arnott's herbarium.

I give below diagnoses drawn up from the examination of the type and authentic specimens, and the revised synonymy and distribution. In the study of the species of this difficult genus *Ectropothecium* the shape and areolation of the *ventral branch-leaves* afford important specific characters. By paying attention to these points the two species *E. vesiculare* (Schwaegr.) and *E. amphibolum* Spruce, which are both variable species and often closely resemble each other, can be at once separated.

ECTROPOTHECIUM VESICULARE (Schwaegr.) Mitt.

*Hypnum vesiculare* Schwaegr. Sp. Musc. Frond. Suppl. 2: 167, pl. 199. 1827; C. Müll. Syn. 2: 235 (sect. *Omalia* subsect. *Vesicularia*) (syn. *Hookeria praelonga* Walk. Arnott excl.) 1851.

*Leskia (Omalia) rutilans* Brid. Bryol. Univ 2: 332 (var. *portoricensis* excl.) 1827.

*Hypnum rutilans* (Brid.) C. Müll. Syn. 2: 234 (sect. *Omalia* subsect. *Vesicularia*) (habitat. quibusdam probabiliter excl.) 1851.

*Ectropothecium vesiculare* (Schwaegr.) Mitt. Musc. Austr.-Amer. 518 (synon. et habitat. peruvianis excl.) 1869; Jaeger, Adumbr. 2: 534 (habitat. peruv. excl.) 1879; Paris, Index Bryol. 89 (syn. et habitat. quibusdam excl.) 1895.

*E. rutilans* (Brid.) Mitt. Musc. Austr.-Amer. 519 (habitat. quibusdam probabil. excl.) 1869; Jaeger, Adumbr. 2: 538 (habitat. quibusdam prob. excl.) 1879; Paris, Index Bryol. 86 (habitat. quibusdam prob. excl.) 1895.

*Vesicularia malachitica* C. Müll. Hedwigia, 37: 251. 1898.

*Ectropothecium malachiticum* (C. Müll.) Paris, Index Bryol. Suppl. 1: 136. 1900.

Tenellum depresso caespitosum laete viride vel aeruginoso-viride raro flavo-viride monoicum; caule tenui interdum subelongato repente hic illic cortici radicularum ope brunnearum fasciculatarum adhaerente ramis distichis depressis saepe alternis interrupte pinnatim ramoso, ramis subcomplanatis approximatis patentissimis saepe per totam longitudinem arcuatis simplicibus vel raro ramulis brevibus perpaucis ramosis brevibus 2–4 mm. longis latitudinem cum foliis 0.80–1 mm. latis interdum elongatioribus ad 8 mm. longis latitudine cum foliis 1.5 mm. latis, foliis caulinis dorsalibus et lateralibus patentibus siccitate imbricatis erecto-patentibus late subtriangularibus et late ovatis acuminatis acumine interdum subrecurvo margine integro vel in folii apice minutissime denticulato cellulis laxis pellucidis superioribus hexagonis circ. 30–40 × 22–25  $\mu$ , foliis caulinis ventralibus minoribus e basi lata oblonga vel subquadrata concava acuminatis acumine plus minus recurvo tenerris areolatis, foliis rameis dorsalibus et lateralibus confertis subdistichis planiuscule compressis patentibus siccitate plus minus crispulis ovatis vel late ovatis interdum rotundato-ovatis breviter et abrupte acuminatis interdum apiculato-acuminatis basi saepe inaequalibus praeter apicem summum minutissime denticulatum

integris nervis binis brevissimis interdum indistinctis cellulis laxis pellucidis late et breviter hexagonis et subhexagonis circ.  $20 \times 25-30 \mu$  basin versus gradatim longioribus, foliis rameis ventralibus multo minoribus et tenerioribus e basi lata ovata concava breviter acuminatis interdum subtriangularibus cellulis laxis hexagonis et subhexagonis circ.  $15-20 \times 40-50 \mu$ , foliis perichaetialibus erectis apice interdum flexuoso-patentibus superioribus caulinis majoribus circ. 1.5 mm. longis e basi ovata vel oblonga tenuiter filiformi-acuminatis enervibus cellulis superioribus longis angustioribus margine integro vel apicem versus minutissime subdenticulato, capsula in pedunculo 1-1.5 cm. longo gracili erecto purpureo laevi apice incurvo breviter et turgide oblonga vel urceolata macrostoma maturitate infra orificium contracta badia horizontali tandem nutante parvula 0.75-1 mm.  $\times$  0.50-0.60 mm. raro  $1.25 \times 1$  mm. leptodermatica basi ima stomatibus superficialibus paucis instructis exothecii cellulis prominentibus subquadratis  $25-30 \mu$  latis ad capsulae orificium subito minoribus, operculo e basi majore convexa plus minus longe apiculato humore vero conico-acuminato, peristomii externi dentibus lineari-lanceolatis basin versus dense striato-trabeculatis badiis apice albidis papillosis interni magnis quandoque emergentibus lanceolatis carinatis lacunis dorsalibus plus minus distinctis ciliis 2-3 vel apice in unum coalitis nodulosis longis interpositis, membrana basilari alta fere ad peristomii externi dentium medium producta, calyptra subulata latere fissa pallide virente; floribus masculis minutis pluribus in caule prope flores femineos positos, foliis perigonalibus ovatis breviter acuminatis integris cellulis laxis hexagonis, antheridiis paraphysibus filiformibus immixtis.

*Hab. Ind. occid*: Jamaica, ad rupes et fontes prope plantationem Richmond, c. fr., leg. D. Reider (in herb. Schwaegr.)! St. Domingo (Hispaniola), c. fr. (in herb. Bridel.)! Cuba, ad truncos putridos in sylvis, c. fr., C. Wright, no. 120, partim, sub *Hypno Montagnei*, (Kew, Brit. Mus. et in herb. Mitten., etiam in herb. Müller., sub *Hypno conostego*, partim)! Porto Rico, Sierra de Lares, ad arbores, c. fr., Feb. 3, 1887, leg. Sintenis (in herb. Müller., sub *Vesicularia malachitica*)!

*Amer. austr*: Brazil, c. fr. (in herb. Mitten.)!

Schwaegrichen's *Hypnum vesiculare* was published in 1827, a good description of the species, together with figures, being given. The type-specimens collected in Jamaica, and preserved in Schwaegrichen's herbarium, represent a rather small state of the species, with branches 3.5 mm. long, which, with the leaves,

measure a little under 1 mm. wide. Very rarely indeed a branch occurs which bears a very short branchlet. The dorsal and lateral branch-leaves are entire, or minutely denticulate at the extreme apex; they commonly approach roundish-ovate in shape, with the apex shortly and often abruptly apiculato-acuminate. These leaves do not exceed 0.75 mm. in length.

In the same year (1827) Bridel published a moss, from St. Domingo, as a new species under the name *Leskia* (*Omalia*) *rutilans*. I have seen the type of this in Bridel's herbarium. The sheet containing it bears two labels; on one is written "*Pterigophyllum rutilans* N. *Leskia rutilans* N. *L. Omalia rutilans* Bryol. Univ. Saint Domingo. Balbis. Lyon. 1820." There are examples of two mosses pasted down above this label, one being the type of Bridel's species, while the other is a species of the genus *Hookeria*. Over the first moss has been written in Müller's handwriting, "*Om. rutilans*;" over the second, "*Alia species*."

Now this type-specimen of Bridel's "*L. rutilans*" agrees exactly with Schwaegrichen's type-specimen of "*H. vesiculare*." One indeed was prepared for the fact of the identity of the two plants on reading Bridel's description of his plant ("Laete virens, complanata, simpliciter pinnato-ramosa, ramis brevibus parallelis. Folia duplici serie disticha, subrotundo-ovata, subintegerrima, laete viridia, laxissime ovato-areolata, diaphana") and comparing it with the description and figures given by Schwaegrichen.

It is most probably the erroneous statement made by authors with regard to the inflorescence of *E. rutilans* which has caused the two plants to be regarded as distinct species up to the present day. Bridel in his diagnosis makes no mention at all of the inflorescence. In Müller's "Synopsis," however, Bridel's plant is described as "dioicum?" In Mitten's "Musci Austro-Amer." we find *E. rutilans* separated as being dioicous from the monoicous species *E. vesiculare*, *E. amphibolum*, etc. As a matter of fact Bridel's plant is monoicous, and the type-specimens bear abundant male and female flowers. Müller in his "Synopsis" compares "*H. rutilans*" with *H. subdenticulatum*, *H. conostegum*, and *H. Poeppigianum*, but not with *H. vesiculare*; we may infer from this that it is most probable that Müller had not seen at the time Schwaegrichen's plant.

Bridel published his species from the single locality, "In Hispaniolâ unde missam Balbisius habuit et communicavit, in arboribus habitat." Müller, however, in describing the plant in the "Synopsis" does not mention this locality, but gives, apparently by a mistake, the habitat "Portorico : Bertero." For the following reason it seems possible that this mistake arose through some error of copying. As mentioned above, there are two labels on the sheet of "*L. rutilans*" in Bridel's herbarium. On one label is written "*Leskia capillaris*, ad saxa locis udis Portorico" in one handwriting, and to this is added, in Bridel's handwriting, "Balbis Lyon 1820." Over the plant to which this label belongs Müller has written "*Omalia rutilans* Brid." It is to be noted, however, that Bridel himself has not in any way identified this moss as belonging to his "*L. rutilans*." An examination of this plant from Porto Rico shows that it belongs to a small form of *Ectropothecium amphibolum* Spruce — agreeing exactly with the plant sent out in Spruce Musc. Amazon. et And. no. 1145, from the Andes of Peru, and also with examples from Cuba (collected by Liebmann) in the Kew Herbarium. It may be questioned, perhaps, if the other localities given by Müller, viz., "Venezuela, Cumbre de Valenzia, alt. 3,000' : Wagner 1848," and "Insula St. Catharina Brasiliae, loc. umbrosis pr. Destero, Jan. et Febr. 1847 : Pabst" really belong to the present species.

The example named "*E. rutilans*" by Mitten, in the Kew Herbarium, from Rio de Janeiro (comm. A. Glaziou, no. 7453) belongs to *E. amphibolum* Spruce ; the inflorescence is monoicous.

Since Schwaegrichen's and Bridel's names date from the same year, we are at liberty to choose either for the present species. Schwaegrichen's name is, however, preferable on every ground, both for the reason that a clear description, indicating the inflorescence, together with a good figure, is given of *H. vesiculare*, and that Bridel included under *L. rutilans* a variety "*portoricensis*," which proves to be specifically distinct.

The plant from Rio de Janeiro (collected by Jameson) published in 1824 as a new species under the name of *Hookeria praelonga* by Walker-Arnott (Mem. Wernerian Nat. Hist. Soc. 5 : 203) was referred to by Wilson (London Jour. Bot. 7 : 278. 1848) in a note on "*Hypnum scaturigenum* Schwaegr." as follows :

"This moss may be the same species as *Hookeria praelonga* Arnott, and possibly, also, *Hypnum vesiculare* Schwaegr." This remark of Wilson's was somewhat altered by Müller, who stated in the "Synopsis," under *Hypnum vesiculare*, "*Hookeria praelonga* W. Arn. ex animadv. Wilsoni in Lond. Journ. of bot. 1848. p. 278, huc pertinere dicitur." Mitten, also (Musci Austro-Amer. 518), quotes *Hookeria praelonga* "W. Arn. ex obs. Wils." as a synonym of *Hypnum vesiculare*. I have been able to examine the type-specimens of *Hookeria praelonga* in Arnott's herbarium at the University of Glasgow, and find that this plant is quite distinct specifically from *E. vesiculare*; it is a species of *Ectropothecium* allied to *E. amphibolum*, or is possibly a form of that species.

"*Hypnum Montagnei*," from Cuba, belongs in part to *E. vesiculare* type, and in part to the var. *Poeppigianum* described below. There is a specimen in the Kew Herbarium, labelled in Montagne's handwriting "*Pterygophyllum Montagnei* Belang. Voy. Ind. Or. Cuba," which is undoubtedly specifically identical with Schwaegrichen's plant. The specimen consists of portions of two fruiting stems, and in the small size and general habit of the plant, as well as in the shape of stem- and branch-leaves, areolation, etc., this Cuban plant agrees exactly with the type-specimen of *E. vesiculare* (from Jamaica) in Schwaegrichen's herbarium. In a few instances, however, the branches reach a length of 5 mm., and measure, with their leaves, about 1 mm. wide. The same plant, in a slightly more robust state, was sent out, under the name *Hypnum Montagnei* Schimp., as part of no. 120 in Wright's Cuban Mosses,—at least as regards the examples under this number in the Kew, British Museum, and Mitten's herbaria. These specimens, whilst certainly belonging to Schwaegrichen's species, represent a larger, more luxuriant state. Some of the branches attain a length of 8 mm., and sometimes, though rarely, bear a short branchlet. The branches with their leaves are about 1.5 mm. wide.

In the example in Müller's herbarium labeled "*Hypnum conostegum* C. Müll., Cuba, decayed logs in forests. Wright n. 120 = *H. Montagnei* Sch. ex C. M.," some of the specimens are clearly the same as the plant from Cuba (collected by Döring) described by Müller as *H. conostegum*—a plant which, as mentioned below, I cannot separate from the var. *Poeppigianum* of *E.*



*vesiculare*. Mixed with these, however, are plants which are clearly referable to *H. vesiculare* type, agreeing perfectly in the habit, the small size, the short branches, and small roundly ovate apiculate-acuminate branch-leaves.

The plant figured natural size under the name *H. Montagnei* Schimp., by Montagne in La Sagra, Hist. Cuba, Crypt. *pl.* 20. *f.* 1, has the more robust habit and regular pinnate branching of the var. *Pocppigianum* described below.

Mitten quotes (Musci Austro-Amer. 519) under *E. amphibolum*, Cuba, "Wright, inter n. 120," but the plant referred to belongs — as the specimen in Mitten's herbarium shows — to *E. vesiculare*. Mitten quotes (*l. c.* 518) also a plant collected by Spruce in the Andes of Peru (Spruce, Musc. Amazon. et And. *no.* 1145) as belonging to *E. vesiculare*. In the examples under this number in Mitten's herbarium, and in the herbaria at Kew and the British Museum, however, the plant is not *E. vesiculare*, but *E. amphibolum*, showing clearly the more denticulate dorsal and lateral branch-leaves, and the characteristic shape and areolation of the ventral branch-leaves of the latter species. The same is also the case with specimens in the Kew Herbarium, from Rio de Janeiro (collected by Glaziov), which have been referred to *E. vesiculare* by Mitten.

In Mitten's herbarium there is a small specimen consisting of part of a stem bearing one seta (without a capsule) labelled "Brazil." This moss unquestionably belongs to true *E. vesiculare*.

Unless careful attention is paid to certain points the present species is very liable to be confused with *E. amphibolum*. *E. vesiculare* type may usually be known by its smaller size, and more compact habit, with the branches more complanate, spreading at right angles, and more or less arcuate; it is, however, by certain characters shown invariably by the branch-leaves that the two species are best distinguished. In *E. vesiculare* the ventral branch-leaves are broadly ovate-acuminate, and the areolation is lax, with hexagonal and subhexagonal cells, measuring  $15-20 \times 40-50 \mu$ . In *E. amphibolum* the ventral branch-leaves are more longly acuminate from a narrower ovate base, or are sometimes ovate-lanceolate; the areolation is narrow, with subprosenchymatous cells measuring  $15 \times 80-100 \mu$ . The dorsal and lateral

branch-leaves, also, of the two species show constant differences. In *E. vesiculare* the leaves are subentire, the margin being minutely denticulate only at the extreme apex; and the areolation of the leaf in the upper half is remarkably lax, with the marginal cells wide. In *E. amphibolum* the margin is more evidently denticulate for a greater distance below the apex; the areolation is decidedly less lax, and the marginal cells are distinctly narrower than the rest, often forming a kind of indistinct border, which is most evident when the leaf is viewed under a low magnification.

Müller has recently (*Hedwigia*, **37**: 251 1898) described a moss from Portorico under the name *Vesicularia malachitica*, with the characters, "monoica; cespites latissime expansi planissimi aeruginosi teneri; folia e cellulis pro foliolo majusculis laxis chlorophyllosis utriculo primordiali repletis breviusculis reticulata, integerrima. . . . E minutissimis Vesiculariis, minutie partium omnium et colore malachitico primo visu distinguenda." Müller quotes the synonym "*Hypnum Montagnei* Hpe. in Musc. Portoricens. Schwaneckianis no. 41" for his plant. I have seen the type-specimens of *V. malachitica* in Müller's herbarium, labelled "Puerto Rico, Sierra de Lares, ad arbores, Feb. 3, 1887, Leg. Sintenis." The moss is certainly *E. vesiculare* Schwaegr., and is identical in the aeruginose color, habit, etc., with the plant sent out as part of number 120 in Wright's Cuban mosses, under the name *Hypnum Montagnei* Schimp., and which Mitten (*Musci Austro-Amer.*) has wrongly referred to *E. amphibolum*.

I have not seen the calyptra of the present species, and have therefore in the diagnosis given above repeated Schwaegrichen's description. Montagne (in La Sagra, *Hist. Cuba*, Bot. 532) says of the calyptra of "*Hypnum Montagnei*" "Calyptra mature decidua longe subulata, pallide viridis, stylo residuo coronata, basi hinc breviter fissa."

***Ectropothecium vesiculare* Poeppigianum** (Hampe).

*Hypnum Montagnei* Schimp. ex Mont. in La Sagra, *Hist. Cuba*, Bot. 530 (partim). 1842; et in La Sagra, *Fl. Cub.* **1**: 315. *pl.* 20. *fig.* 1 (partim). 1853.

*Hookeria Poeppigiana* Hampe, *Icon. Musc.* *pl.* 4. 1844.

*Hypnum Poeppigianum* Hampe ex C. Müll. *Syn.* **2**: 235 (sect. *Omalia*, subsect. *Vesicularia*) 1851.

*H. conostegium* C. Müll., *l. c.* 242 (sect. *Omalia*, subsect. *Vesicularia*) (synon. et habitat. portoric. excl.) 1851.

*Ectropothecium flavoviride* Mitt. Musc. Austr.-Amer. 518. 1869; Jaeger, Adumbr. 2: 534. 1879; Paris, Index Bryolog. 81. 1895.

*E. conostegum* (C. Müll.) Mitt. Musc. Austr.-Amer. 519. 1869; Jaeger, Adumbr. 2: 537 (Brideli syn. et habitat portoric. excl.) 1879; Paris, Index Bryolog. 79 (Brideli syn. et habitat. portoric. excl.) 1895.

*E. Poeppigianum* (Hampe) Jaeger, Adumbr. 2: 534. (Mitteni syn. et Lindigi planta excl.). 1879.

*Vesicularia conostega* C. Müll. Hedwigia, 37: 252. 1898.

Monoicum, fusco- vel flavo-viride, laxe et depresso caespitosum, caespitibus intricatis mollibus, caule repente praelongo flexuoso inferne radiculoso irregulariter pinnato vel raro hic illic subbipinnato, ramis inaequalibus ad 7 mm. longis simplicibus vel raro parce et vage ramosis patulis vel patentibus distichis haud complanatis cum foliis circ. 1.5 mm. latis, foliis caulinis erecto-patentibus imbricatis saepe apice parum uncinatis vix compressis siccitate inflectentibus dorsalibus et lateralibus oblongo- vel ovato-acuminatis circ. 1.5 mm. longis acumine longo tenui flexuoso saepe recurvo lateralibus basi inaequalibus cellulis firmissculis superioribus hexagonis et subhexagonis  $50 - 70 \times 12 - 15 \mu$  inferne longioribus rectangulo-subhexagonis utriculo primordiali contracto repletis margine nisi in acumine minutissime subdenticulato integerrimo interdum ad folii medium recurvo nervis binis brevibus plerumque inaequilongis, foliis caulinis ventralibus minoribus circ. 1 mm. longis e basi late ovali vel subquadrata abruptius tenuiter acuminatis tenerius areolatis cellulis hexagonis et elliptico-subhexagonis  $40 - 70 \times 13 - 15 \mu$ , foliis rameis haud complanatis multiseriatis vix compressis erecto-patentibus imbricatis saepe plus minus uncinatis dorsalibus et lateralibus circ. 1 mm. longis ovatis vel oblongis sensim acuminatis lateralibus angustioribus ovato-lanceolatis basi saepe inaequalibus, acumine fragili plus minus longe producto, margine in folii summo apice minutissime denticulato alibi integro cellulis superioribus firmissculis hexagonis et subhexagonis  $45 - 60 \times 12 - 15 \mu$  marginalibus in folii parte superiore latis omnibus utriculo primordiali contracto repletis nervis binis brevibus distinctis, foliis rameis ventralibus minoribus nunc e basi concava oblonga vel ovata lanceolatis nunc oblongis vel ovatis plus minus longe acuminatis (in rami parte inferiore saepe subulato-acuminatis acumine curvato) margine subintegro tenerius areolatis cellulis hexagonis et subhexagonis circ.

40 — 60  $\times$  13 — 15  $\mu$  nervis binis brevibus, foliis perichaetialibus erectis superioribus apice flexuosis e basi oblongo-ovata truncata filiformi-acuminatis laxe reticulatis margine integro vel subintegro, capsula in pedunculo gracili subflexuoso purpureo glabro 1.5 cm. alto apice incurvo parvula 1.25  $\times$  0.75 mm. badia suburceolata pendula, operculo turgide conico acutiusculo, "peristomii dentibus interni ciliis binis."

*Hab.* — *Amer. austr.* — Peruvia; sylvae primaevae, Cuchera, c. fr. (leg. Poeppig, 1829), Poeppig, Musci frondosi no. 12 (Herb. Hamp.)! Andes peruviana (Spruce)!

*Ind. occid.* — Cuba, ad truncos putridos in sylvis (Wright, no. 120, sub *Hypno Montagnei* Schimp., partim, = *E. flavoviride* Mitt. in herb. Mitten. et = *Hypnum conostegum* C. Müll. in herb. Müller). Cuba, Döring in Hb. Kunzeano. Sept. 25, 1843 (sub. *Hypno conostego* C. Müll. in herb. Müller). St. Domingo, in monte "Isabel de la torre," 600 m. alt., June 3, 1887, leg. Eggers (sub *H. conostego* C. Müll. in herb. Müller).

Hampe in 1844 described the present plant, from examples collected by Poeppig in Peru, as *Hookeria Poeppigiana*. Müller in the "Synopsis" placed the moss in the genus *Hypnum* — section *Omalia*, subsection *Vesicularia* — between *H. rutilans* and *H. vesiculare*, and contrasted it with the latter species. In 1869 Mitten (Musci Austro-Amer. 518) without seeing specimens of Hampe's plant, quoted "*Hookeria Poeppigiana*" as a synonym of *Ectropothecium vesiculare*, and since this date authors have, almost without exception, followed Mitten in referring Hampe's plant from Peru to Schwaegrichen's species, *E. vesiculare*, from Jamaica. Jaeger (Adumbr. 2: 534), who maintains Hampe's species and who was the first to place it in *Ectropothecium*, gives the reference "*Ectropothecium vesiculare* forma Mitt. Musc. Austr. Amer. p. 518," this, however, is incorrect, the word "forma" not occurring in the place cited. Jaeger quotes as a locality for the species "Nova Granada, in silvis ad flumen Magdalenae (A. Lindig)." There are examples of this plant in Hampe's herbarium, labelled in Hampe's handwriting, "*Hypnum Poeppigianum*," from "Nova Granata, ad flum. Magdalenae, December, 1862 in sylvis leg. A. Lindig." This moss, however, is certainly not the same species as is represented by Hampe's type-specimens from Peru, but belongs clearly to *E. amphibolum* Spruce. The same is the case with another moss in Hampe's herbarium labelled "*Hypnum callidum* Mont.

Chile; Huallagua super in arboribus ad Missionem Tocache Jul. 1830 Poeppig." On the label has been written in Müller's handwriting "*= Hookeria Poeppigiana* Hampe," and "*= Leskea rutilans* Brid. nach Originalexempl."

Further, there is a moss in Hampe's herbarium labelled "Musc. Andini Amazonici 1155 zu 1144. *Hypnum glaucosum* C. Müll. n. sp. *Ectropothecium subdenticulatum* Mitt. non C. Müll. Andes Peruviana." An examination of the specimen, which consists of a few stems only, shows that there is a mixture of two species here, one being Hampe's *Hookeria Poeppigiana* — the plant agreeing in every way with Hampe's type; while the other is *E. amphibolum* Spruce.

In 1851 Müller published as a new species, in the section *Omalia*, subsection *Vesicularia*, of *Hypnum*, a plant from Cuba, (collected by Döring) under the name of *H. conostegum*, placing it, with the single species *H. subdenticulatum* in the section "*Folia denticulata, longe acuminata*," whilst *H. Poeppigianum* was placed in the section "*Folia integerrima, breviter acuminata*." The following description was given: "*monoicum; H. subdenticulato simillimum, sed irregulariter pinnatum, ramis siccitate distincte curvatis flexuosis tenerioribus subcontortis lutescentibus hic illic fuscidulis, humore patentibus; folia obsolete denticulata saepe integerrima; pedunculus, theca et peristomium H. Pöppigiani; operculum turgide conicum acutum*." I have seen the type-specimen, labelled "*Hypnum conostegum* n. sp. Cuba: Döring in Hb. Kunzeano 25.9.1843," in Müller's herbarium. It is clearly the same plant as Hampe's *Hookeria Poeppigiana*, agreeing perfectly in habit, color, areolation and other leaf-characters.

These Cuban examples agree with certain specimens of the var. *Poeppigianum* in Bescherelle's herbarium, labelled "Peruv. Andes; Cocheras, Poeppig," in showing a variation in the shape of some of the branch-leaves which point out clearly the passage to *E. vesiculare* type. In Hampe's plant, as well as in Müller's type-specimens of *H. conostegum*, the dorsal and lateral leaves of some branches are more or less long-acuminate, while in other branches of the same stem these leaves (in the upper part of the branch) are broadly ovate and short- and abrupt-acuminate,—or even apiculate-acuminate, with slightly laxer areolation.

Two other examples of "*H. conostegum*" occur in Müller's herbarium. The first, which is labelled "*Hypnum conostegum* C. M. Cuba, decayed logs in forests, Wright n. 120 = *H. Montagnei* Sch. ex C. M.," quite agrees with the plant collected in Cuba by Döring, and, like that, often shows an approach in the shape of the branch-leaves to *E. vesiculare* type. It is of interest to note, however, that the main stem of some of these specimens is often thick, especially towards the apex, and that the apex of the branches is often incurved, and also that the points of the dorsal and lateral leaves of both stem and branches are slightly decurved, so that the stems have a very different appearance viewed from above and below.

The second example is labeled "*H. conostegum* m. St. Domingo in monte 'Isabel de la torre,' 600 m. alt. 3.7.87 leg. Eggers." This also has rather thick stems, with the points of the leaves decurved. It is, however, like the other example, clearly the same plant as Hampe's *Hookeria Poeppigiana*, in the type-specimen of which the same leaf-characters are sometimes observable.

With regard to the shape of the operculum—"operculum *turgide conicum acutum*"—advanced by Müller as a distinguishing character, it may be noted here that, as Montagne (in La Sagra, Hist. Cuba, Bot. 532) has already pointed out, the operculum of the present plant is *in the dry state* apiculate or mucronate, but becomes conical acuminate *on being moistened* ('operculum in statu sicco plus minus longe apiculatum vel mucronatum, humecto vero conico-acuminatum'). The FIGURES 19 and 20 which I have given on PLATE 14 show the change which takes place in the shape of the operculum.

It must be noted here that Müller quotes in the Synopsis, under *H. conostegum* the locality "Portorico: Bertero," and remarks "*Leskea (Omalia) rutilans*  $\beta$  *Portoricensis* Brid. 11, p. 332 e spec. imperfectis Hb. Brid. forma flaccidior videtur." I have seen the type of Bridel's plant above referred to;—the sheet bears the label, in Bridel's handwriting, "*L. Omalia rutilans*  $\beta$  *Portoricensis* Bryol. Univ. *Pterigophyllum pendulum* N. *L. Omalia Portoricensis* Bryol. Univ. In Porto Ricco ad saxa et arbor. Balbis Lyon 1820." On the sheet, above the specimens, Müller has written "*Acosta conostega* mihi videtur." Now this plant of Bridel's from Porto Rico, of which a fair, fruiting example still exists in his her-

barium, is certainly not Müller's *H. conostegum*, but it is identical with *E. amphibolum* Spruce.

Mitten, in 1869, in *Musc. Austr.-Amer.* 518, published, as a new species "*Ectropothecium flavoviride*. Ins. Cuba, Wright, n. 120, ex parte." I have examined the type in Mitten's herbarium, and find that it agrees well with Hampe's *H. Poeppigiana*. Whilst clearly belonging, in my opinion, to this, it is somewhat marked in possessing long-acuminate and rather narrow leaves, and in having the margin of the dorsal branch-leaves recurved at the middle of the leaf. The ventral branch-leaves in Mitten's type are frequently subulate-acuminate. In some of the branches of the type-specimens of *H. Poeppigiana*, however, the ventral branch-leaves are of exactly the same shape (while on other branches they are simply acuminate), and occasionally, also, the margins of the dorsal branch-leaves are recurved.

Part of the specimen in the Kew Herbarium under the *no.* 120 in Wright's Cuban Mosses is the same plant as Mitten's *E. flavoviride*.

The present plant, described by Hampe as *Hookeria Poeppigiana*, certainly presents characteristics which might lead us at first sight to suppose that it was specifically distinct from *E. vesiculare*. These characteristics are the more robust habit (shown in Hampe's figure), the pale color, the longer stems with less patulous branches which sometimes bear secondary branchlets, and especially the different shape and arrangement of the branch-leaves. In the present plant the dorsal and lateral branch-leaves are usually longer, narrower, more acuminate and with firmer areolation than in *E. vesiculare*, and the branch-leaves are more crowded and arranged in many rows, so that the branches present a very different appearance from the complanate branches of *E. vesiculare* type, with their marked subdistichous arrangement of dorsal and lateral branch-leaves. As pointed out above, however, we find both in authentic specimens of *Hookeria Poeppigiana* from Peru, and of *Hypnum conostegum* from Cuba, some stems showing characters which clearly point to too close an affinity with *E. vesiculare* to allow of the present plant being given more than a varietal rank.

From all forms of the variable *E. amphibolum*, Spruce, *E. vesiculare Poeppigianum* may be at once distinguished by the less

denticulate dorsal and ventral branch-leaves, with wider marginal cells towards the apex of the leaf, and by the wider areolation of the ventral branch-leaves. I have not seen the peristome of the present plant, and have therefore, in the diagnosis given above, copied the description given by Hampe in Müller's Synopsis.

It would appear from the figure given by Montagne that the Cuban "*Hypnum Montagnei*" is *E. vesiculare Poeppigianum*, although the specimen in the Kew Herbarium, from Montagne's herbarium, is certainly *E. vesiculare* type (see above). It may be noted that Paris (Index Bryolog. 84) cites wrongly the reference "Mont. in Hist. Cuba, Crypt. p. 530, t. 20, f. 1" for the true *E. Montagnei* (Bel.) Jaeger. The latter species, from authentic specimens I have seen, is distinct from *E. vesiculare* — although evidently closely allied — in the more robust habit, the branches with more densely arranged leaves, and in the branch-leaves being of a different shape, hamate at the apex, and with different areolation; the ventral branch-leaves, also, are wider and more suddenly acuminate.

*E. crassicaule* Mitt. is — as the type-specimen in Mitten's herbarium shows — different from all the plants described above, and presents the following characters. The plant is straw-colored, with here and there branches showing a rich fuscous tinge of color; the stem is closely pinnate, with branches of unequal length which are usually curved at the apex. The stem-leaves are very crowded, and seen from the dorsal side of the stem are imbricate in several rows. They are gradually long-acuminate from a truncate broadly ovate or oblong base, the acumen is long, fine and flexuous, the margin is entire (with the marginal cells very distinct) except in the acumen, where it is obscurely and minutely denticulate, or subentire. The areolation is lax, with hexagonal or elongate-subhexagonal cells, the walls of which become subporose. The ventral stem-leaves are smaller and wider, and the cells have thinner walls. They are suddenly acuminate from a subquadrate or broadly oblong truncate base; the acumen is long and usually filiform, and is often flexuously contorted. The points of all the stem-leaves are regularly hamate, being curved towards the ground. The branch-leaves are crowded, and strongly hamate; the dorsal branch-leaves are lanceolate and ovate-lanceolate, attenuated to a fine acumen; the margin is entire below, minutely



denticulate above; the cells are lax, and hexagonal in shape. The ventral branch-leaves are smaller, and more abruptly acuminate from a broadly oblong or subquadrate base; the cells are more delicate, hexagonal in shape, but longer; the acumen is long and fine. Seta about 2 cm. long; capsule pendulous. The habit is very *hypnoid* (as in other species of *Ectropothecium*), and in the regularly hamate leaves, all turned in one direction (so that the dorsal surface of the stem and branches has a smooth or almost glossy appearance, while viewed from below the stem and especially the branches bristle with the flexuose arcuate points of the leaves) the plant recalls such a species as *Hypnum cupressiforme*.

Mitten's type is labeled "120 *Hypnum Montagnei* Schimp. in Mont. Crypt. Cub. p. 530, t. 20. Hab. decayed logs in forests. Cuba, Wright, ex parte."

In the Kew Herbarium part of the specimens under the no. 120 in Wright's Cuban Mosses belongs to *E. crassicaule* Mitt., and agrees with the type in every way except that many of the dorsal branch-leaves are a little broader, being ovate-acuminate instead of lanceolate.

#### Explanation of plates 13 and 14

##### PLATE 13

FIG. 1. *Ectropothecium vesiculare* (Schwaegr.) Mitt., ventral branch-leaf,  $\times 68$ . FIG. 2. Areolation of same at  $\frac{1}{3}$  from the apex,  $\times 400$ . FIG. 3. Areolation of a dorsal branch-leaf at  $\frac{1}{3}$  from the apex,  $\times 400$ . (Figs. 1-3 drawn from the plant in Wright's Cuban Mosses, no. 120, in the Kew Herbarium.)

FIG. 4. *E. amphibolum* Spruce, ventral branch-leaf,  $\times 68$ . FIG. 5. Areolation of same at  $\frac{1}{3}$  from the apex,  $\times 400$ . FIG. 6. Areolation of a dorsal branch-leaf at  $\frac{1}{3}$  from the apex,  $\times 400$ . (Figs. 4-6 drawn from the plant in Spruce, Musc. Amazon. et And., no. 1145.)

FIG. 7. *E. vesiculare* (Schwaegr.) Mitt., apex of a dorsal branch-leaf,  $\times 255$ . FIG. 8. A ventral branch-leaf, towards the base of the branch,  $\times 52$ . FIG. 9. Perichaetial leaf,  $\times 25$ . (Figs. 7-9 drawn from the type in Schwaegrichen's herbarium.)

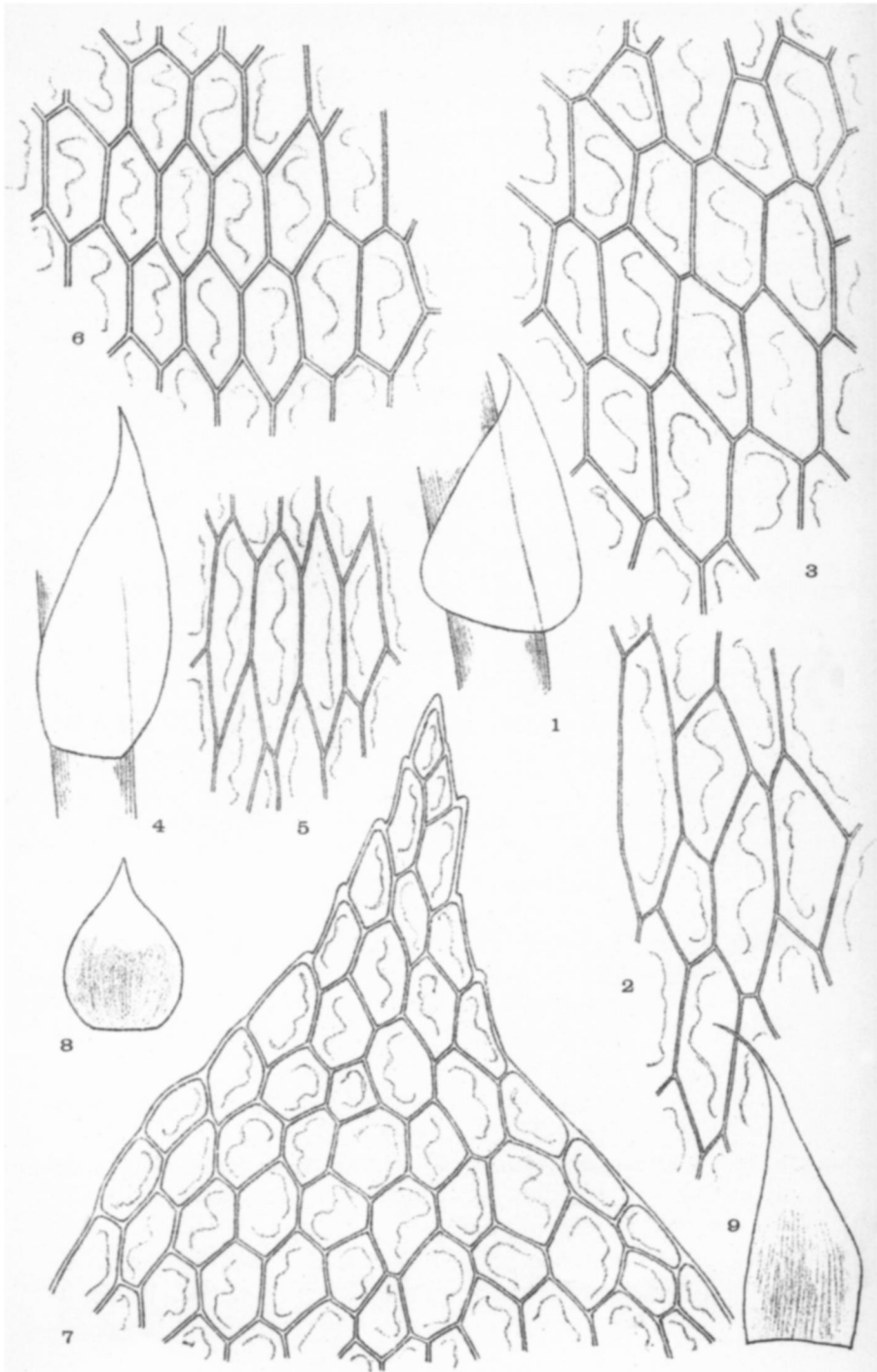
##### PLATE 14

FIGS. 10, 11. *E. vesiculare* (Schwaegr.) Mitt., a dorsal and a lateral branch-leaf,  $\times 52$ . FIG. 12. Areolation of the apical part of the same dorsal branch-leaf,  $\times 400$ . (Figs. 10-12 drawn from the type in Schwaegrichen's herbarium.)

FIG. 13. *E. amphibolum* Spruce; marginal areolation of a lateral branch-leaf at  $\frac{1}{4}$  from the apex of the leaf,  $\times 255$  (drawn from the plant in Spruce Musc. Amazon. et And., no. 1148.)

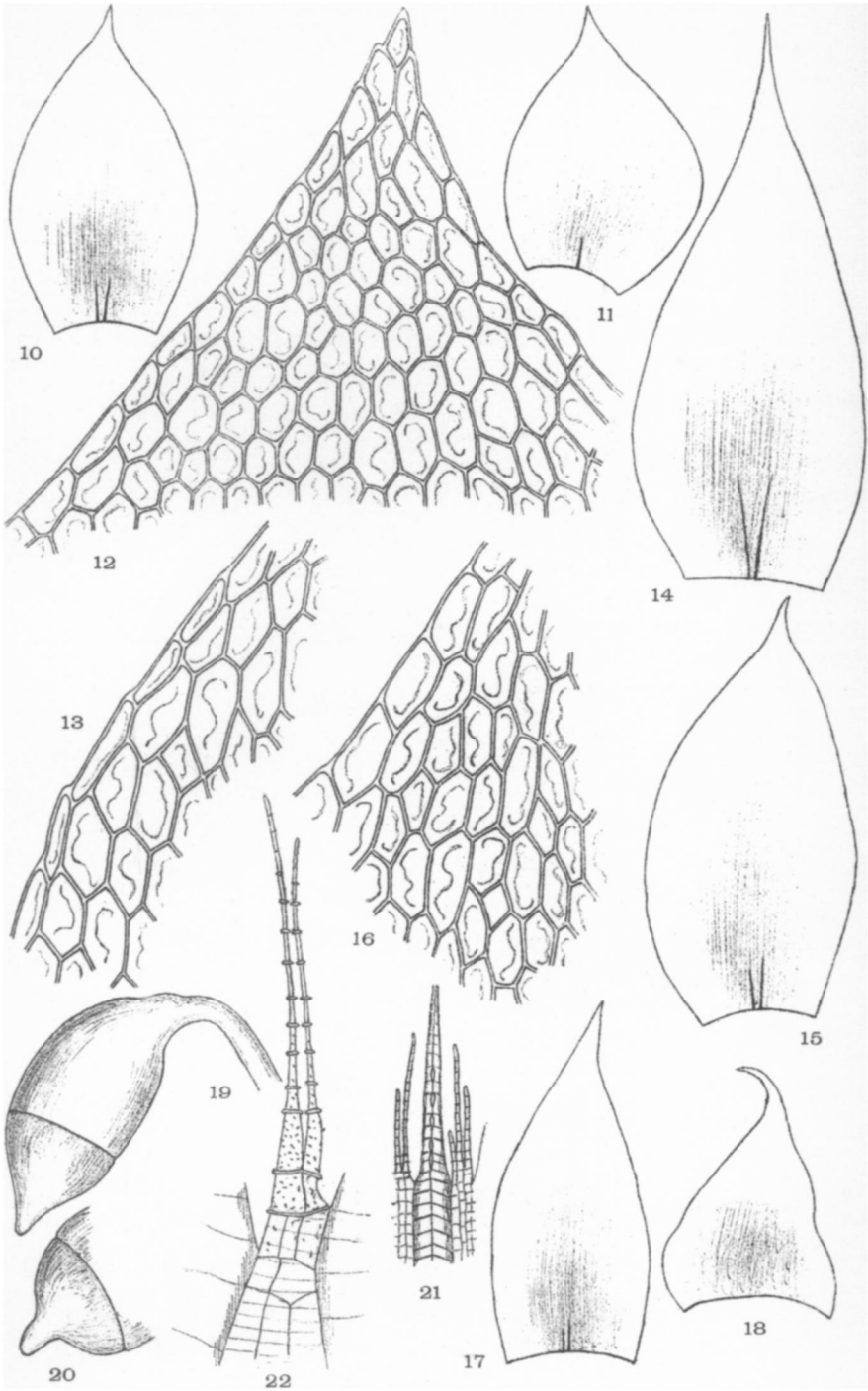
FIGS. 14, 15. *E. vesiculare* Poeppigianum (Hampe), a dorsal and a lateral branch-leaf,  $\times 52$ . FIG. 16. Marginal areolation of a dorsal branch-leaf at  $\frac{1}{4}$  from the apex of the leaf,  $\times 255$ . (Figs. 14-16 drawn from the type in Hampe's herbarium.)

FIGS. 17-22. *E. vesiculare* (Schwaegr.) Mitt.; 17, 18, two stem-leaves, from the superior side of the stem,  $\times 52$ ; 19, capsule, in moistened state,  $\times 25$ ; 20, operculum, dry,  $\times 25$ ; 21, part of inner peristome,  $\times 150$ ; 22, cilia of same,  $\times 255$ . (Fig. 19 drawn from the plant in Wright's Cuban Mosses, no. 120, in the Kew Herbarium; figs. 17, 18, 20-22 from the type in Schwaegrichen's herbarium.)



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